METHOD AND APPARATUS FOR SOLVING AN EQUALITY CONSTRAINED GLOBAL OPTIMIZATION PROBLEM

ABSTRACT

One embodiment of the present invention provides a system that solves a global optimization problem specified by a function f and a set of equality constraints $q_i(\mathbf{x}) = 0$ $(i=1,...,r)$, wherein f is a scalar function of a vector $\mathbf{x} = (x_1, x_2, x_3, \ldots x_n)$. During operation, the system receives a representation of the function f and the set of equality constraints and stores the representation in a memory. Next, the system performs an interval equality constrained global optimization process to compute guaranteed bounds on a globally minimum value of the function $f(\mathbf{x})$ subject to the set of equality constraints. During this process, the system applies term consistency to a set of relations associated with the interval equality constrained global optimization problem over a subbox **X**, and excludes any portion of the subbox **X** that violates the set of relations. It also applies box consistency to the set of relations, and excludes any portion of the subbox **X** that violates the set of relations. Finally, the system performs an interval Newton step for the interval equality constrained global optimization problem over the subbox **X**. The system integrates the sub-parts of the process with branch tests designed to increase the overall speed of the process.